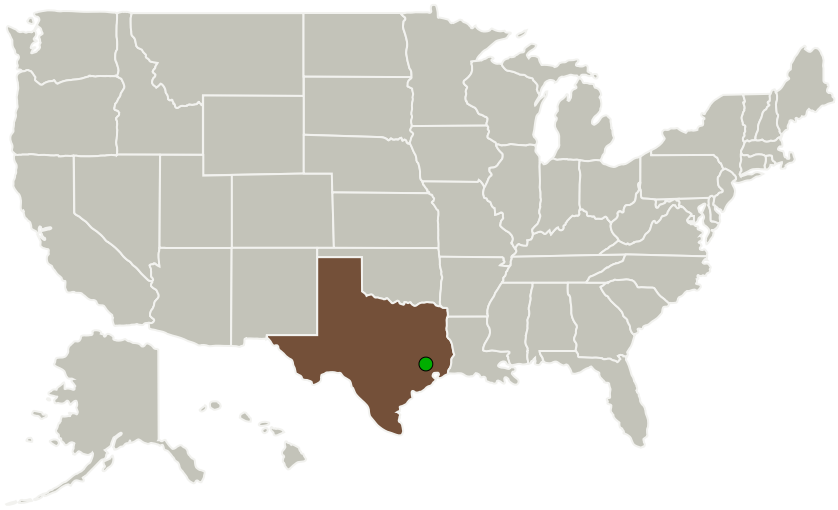
Bridging the Gap Between Procedure Definition and Robot Execution, Phase I

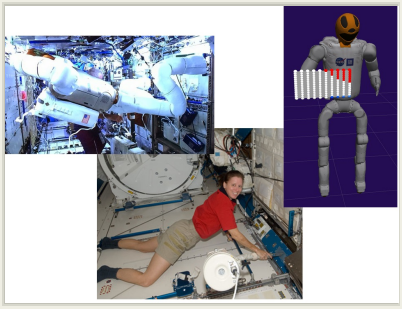
Completed Technology Project (2015 - 2015)

Project Introduction

As space missions grow longer and more complex, it will be useful for humanoid robots to take over routine and maintenance duties. Such robots will need to be able to follow procedures that were originally authored for human agents. Unfortunately, subtasks that are trivial for a human can be incredibly complex for a robot to execute, and many assumptions about the capabilities and state of the agent can be hidden in the procedure. If humanoids are to become truly useful in this context, we need to develop a methodology – a language – for interpreting procedure steps into goals and skills that are relevant to the deliberative layer of a robot's control system. In this project, we propose to analyze representative procedures for routine activities on ISS and develop an interpretation of them that can be understood by a prototype executive software layer connected to the API for R2. We will demonstrate the execution of these translated procedures on the Simulation of R2 on ISS. R2 on ISS is an ideal testbed for such studies. This work has immediate application to the humanoids being developed at NASA/JSC, such as R2 and Valkyrie, and should have broad applicability in the DoD and industry.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
TRACLabs, Inc.	Lead Organization	Industry	Webster, Texas
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations
Texas

Project Transitions

June 2015: Project Start

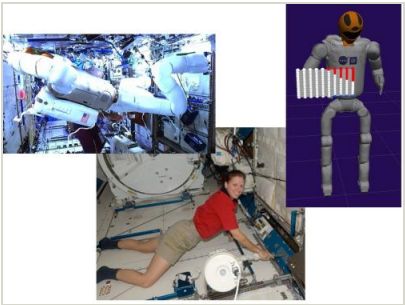
December 2015: Closed out

Closeout Summary: Bridging the gap between procedure definition and robot execution, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138848)*

Images



Briefing Chart Image
Bridging the gap between procedure definition and robot execution, Phase I
(https://techport.nasa.gov/image/130280)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
TRACLabs, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

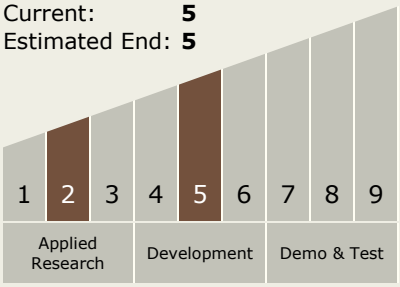
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Robert Burridge

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.4 Sample Acquisition and Handling

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System